

Remarks

Entry of the amendments, reconsideration of the application, as amended, and allowance of all pending claims are respectfully requested. Claims 1-3, 6-10, 13-16, and 19-20 remain pending.

Applicants have amended claims 1-3, 6-10, 13-16 and 19-20, and canceled claims 4, 5, 11, 12, 17, and 18 from further consideration in this application. Applicants are not conceding in this application that those claims are not patentable over the art cited by the Examiner. The present claim amendments and cancellations are only for facilitating expeditious prosecution of the currently presented claims. Applicants respectfully reserve the right to pursue these and other claims in one or more continuations and/or divisional patent applications.

Support for the amendments may be found throughout applicants' specification (e.g., paragraphs 17, 18, 20, 22, and 34), and therefore no new matter is added.

Applicants' gratefully acknowledge the time afforded applicants' attorney, Blanche E. Schiller, during a telephonic interview with Examiner Meng Yao Zhe and Supervisor Joseph Delso on June 11, 2007, in which the rejection to claim 1 and proposed claim amendments were discussed. In particular, applicants discussed that their invention relates to balancing workload of a grid computing environment and further discussed proposed amendments to the claims. No agreement was reached as to the claims.

Further, applicants discussed the rejection of the Information Disclosure Statement in which it was indicated that a legible copy of each cited foreign patent document was to be provided. Applicants explained that the only document that they had was an Abstract and that the Abstract was provided to the Patent Office. Supervisor Delso asked that we resubmit the IDC with that Abstract. Applicants have complied with this request herein.

Additionally, during the telephonic interview, the §101 rejection of claims 8-14 were discussed. Supervisor Delso indicated that the Office was looking for the location in the specification in which the means for are described. Pursuant to this request, applicants respectfully submit that the means include a system, such as System A or System B of FIG. 1

and described throughout applicants' specification (e.g., paragraphs 14-15). Thus, applicants respectfully request withdrawal of the §101 rejection of claims 8-14.

In addition to the above, claims 1, 8 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Xu (U.S. Patent No. 6,418,462); claims 1-6, 8-13 and 15-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Guo et al. (U.S. Publication No. 2005/0071843); and claims 7, 14 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Guo in view of Suzuki et al. (U.S. Patent No. 4, 394,730). Applicants respectfully, but most strenuously, traverse these rejections to any extent deemed applicable to the amended claims for the reasons below.

In one embodiment, applicants' invention relates to the managing of workload of a grid computing environment. As one example, a manager daemon of the grid computing environment obtains information regarding one or more other systems of the environment, and determines based on the obtained information placement of workload on those systems. The placement of workload can include, for instance, moving a job from one system to another or initially placing a job on a particular system. As one example, the information is obtained from complex schedulers on the system.

As one particular example, applicants claim a method of balancing workload of a computing environment (independent claim 1). The method includes, for instance, obtaining, by a manager daemon of one system of a grid computing environment, scheduler information from a scheduler of another system of the grid computing environment, the scheduler information including current free nodes of the another system, job queue of waiting jobs for the another system, shadow time for the next waiting job of the another system indicating how long the job needs to wait for resources, and one or more resources protected by shadow time; and performing by the manager daemon workload balancing of at least two systems of the grid computing environment, each system of the at least two systems including a scheduler to schedule workload on its system, the workload balancing using at least a portion of the obtained scheduler information, and wherein the workload balancing comprises backfill scheduling a job, the backfill scheduling allowing the job to run out of order as long as it does not affect the start time of another job scheduled to execute.

Thus, in this aspect of applicants' claimed invention, workload balancing of a grid computing environment is performed. A manager daemon of one system of the grid computing environment obtains scheduler information from a scheduler of another system of the grid computing environment. That scheduler information includes particular information, such as shadow time for the next waiting job of the another system indicating how long the job needs to wait for resources, and one or more resources protected by shadow time. The manager daemon performs workload balancing of at least two systems of the grid computing environment in which the workload balancing includes backfill scheduling of a job. One or more of these aspects are not described, taught or suggested by Xu, Guo or any of the other cited art, either alone or in combination, and therefore, applicants' invention is patentable over the cited art.

For example, Xu describes a sideband service distributed computing method in which a client system performs work for a server, when the client system is idle. There is no discussion in Xu of a grid computing network that includes a manager daemon that obtains scheduler information from a scheduler of another system in the grid computing environment. In Xu, the server merely sends a task to a client (see, e.g., col. 5, lines 2-3, lines 19-24), and the client performs that task if idle. There is no description in Xu of obtaining scheduler information from the client, as claimed by applicants.

Further, there is no discussion in Xu of a manager daemon of a grid computing environment obtaining scheduler information from a scheduler of another system of the grid computing environment, in which that scheduler information includes current free nodes of the another system, job queue of waiting jobs for the another system, shadow time for the next waiting job of the another system indicating how long the job needs to wait for resources, and one or more resources protected by shadow time, as specifically claimed by applicants. There is no discussion in Xu of shadow time or the other types of scheduling information claimed by applicants. This information is not needed in a system such as Xu's, in which a server merely divides a task and sends a piece of the task to a client to be executed during idle time of the client.

Yet further, Xu does not describe, teach or suggest workload balancing that includes backfill scheduling that allows a job to run out of order as long as it does not affect the start time of another job scheduled to execute. For example, in backfill scheduling, if it is known that a job needs 200 nodes to execute, but only 100 nodes are available now and the other 100 nodes are available in an hour, backfill scheduling allows a job that is 100 nodes or less and that can be completed within one hour to start out of turn, instead of waiting for the other job to complete. There is no such discussion in Xu of backfill scheduling.

Since Xu fails to describe, teach or suggest one or more aspects of applicants' claimed invention, Xu does not anticipate applicants' claimed invention. Therefore, applicants' claimed invention is patentable over Xu.

Moreover, Guo fails to describe, teach or suggest one or more features of applicants' claimed invention. For example, while Guo teaches a NUMA system, it is understood in the art that a single NUMA system, as described in Guo, is not a grid computing environment, and therefore, Guo fails to describe, teach or suggest balancing workload of a grid computing environment.

Additionally, Guo fails to describe, teach or suggest the particular scheduler information that is obtained by the manager daemon of a system of the grid computing environment, as claimed by applicants. For example, Guo fails to describe, teach or suggest shadow time for the next waiting job of another system indicating how long the job needs to wait for resources. Further, Guo fails to describe, teach or suggest one or more resources protected by shadow time. There is no discussion of shadow time in Guo.

Moreover, Guo fails to teach or suggest backfill scheduling which allows a job to run out of order as long as it does not affect the start time of another job scheduled to execute. Backfill scheduling is not described, taught or suggested in Guo. Since Guo fails to describe, teach or suggest one or more aspects of applicants' claimed invention, Guo does not anticipate applicants' claimed invention.

For at least the above reasons, applicants respectfully submit that independent claim 1, as well as the other independent claims, are patentable over Xu and Guo. Further, Suzuki

does not overcome the deficiencies of either Xu and Guo. Thus, the independent claims, as well as the dependent claims, are patentable over the cited art, either alone or in combination.

Should the Examiner wish to discuss this case with applicants' attorney, please contact applicants' attorney at the below listed number.

Respectfully submitted,

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